Exercise after stroke to prevent falls, enhance mobility and increase physical activity:

The Stroke Club Trial

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NSW FALLS PREVENTION NETWORK FORUM 2011
OVERVIEW

- Background
- Stroke Club Trial
- Translation into practice
BACKGROUND

1. Stroke is Australia’s second single greatest killer after coronary heart disease and a leading cause of disability.

2. In 2010, Australians will suffer around 60,000 new and recurrent strokes – that’s one stroke every 10 minutes.

3. One in five people having a first-ever stroke die within one month and one in three die within a year.

4. The number of strokes will increase each year due to the ageing population.

5. The FAST test is an easy way to recognise and remember the signs of stroke.
   • Face – Check their face. Has their mouth drooped?
   • Arms – Can they lift both arms?
   • Speech – Is their speech slurred? Do they understand you?
   • Time – Time is critical. If you see any of these signs call 000 now!

Source: www.strokefoundation.com.au
6. In the next ten years more than half a million people will suffer a stroke.

7. Stroke kills more women than breast cancer.

8. **About 88 per cent of stroke survivors live at home and most have a disability.**

9. Close to 20 per cent of all strokes occur to people under 55 years old.

10. Strokes cost Australia an estimated $2.14 billion a year.

Source: www.strokefoundation.com.au
BACKGROUND

Stroke in NSW

• Acute Stroke Units have been introduced

• Discharge Location\(^1\)
  - 52% directly home
  - 27% inpatient rehabilitation
  - 21% aged care facilities

BACKGROUND

Mobility

Poor mobility common after stroke
- walking speed and walking capacity is markedly reduced
- over 90% are unable to walk well enough to function effectively in the community\(^1\)

Physical activity levels are low
- as low as 1,389 steps/day\(^2\)
- activity counts:
  Stroke 5656 (SD 4091) vs Control: 10,964 (SD 3804)\(^3\)

2. Michaels K et al Top Stroke Reh 2007;14;5 -12
3. Alzahrani M et al JoP 2011;57: 47-51
BACKGROUND

Falls

Falls are common after stroke

• 50-73% will fall within 6 months of discharge from hospital\(^1,2,3\)
• 1 in 2 female stroke survivors continue to fall each year\(^4\)
• people after stroke are 4 times more likely to suffer a fracture in a fall\(^5\)

\(^1\) Mackintosh SFH et al Aging Clin Exp Res 2005; 17:2 1-8
\(^2\) Batchelor F et al Stroke 2010; 41:1715-1722
\(^3\) Macintosh SFH et al Clin Rehab 2005; 19:441-451
\(^4\) Lamb SE et al Stroke 2003 34:494-501
\(^5\) Ramnemark A et al Osteoporos Int 1998:8;2-95
BACKGROUND

• Good evidence exercise can enhance mobility after stroke\textsuperscript{1-4}
  – yet ongoing exercise opportunities are non-existent
• Good evidence that well-designed exercise programs can prevent falls in older people\textsuperscript{5,6}
  – ?? whether exercise can prevent falls after stroke\textsuperscript{7}

\textsuperscript{1}Outpatient Service Trialists. Lancet. 2004 Jan 31;363:352-356.
\textsuperscript{5}Sherrington C et al J Am Geriatr Soc. 2008;56:2234-2243
\textsuperscript{6}Gillespie LD, Cochrane Database Syst Rev. 2009 Apr 15;(2):CD007146.
\textsuperscript{7}Batchelor F et al Stroke 2010; 41:1715-1722
The Stroke Club Trial Investigators

- Catherine Dean
- Chris Rissel
- Cathie Sherrington
- Michelle Sharkey
- Robert Cumming
- Stephen Lord
- Catherine Kirkham
- Sandra O’Rourke
- Ruth Barker

- Funding: NSW Health Promotion Research Demonstration Grant
Questions

Primary Research Question

– Effect of the Weight-bearing Exercise for Better Balance (WEBB) program on falls, walking capacity and speed, among community dwelling stroke survivors

Secondary Research Questions

– Effect of the WEBB program on physical activity levels, community participation, health status and health service utilisation

– Is the network of the NSW Stroke Recovery Association’s Stroke clubs an effective and sustainable way of providing an ongoing exercise intervention?
Design

Pre-Assessment

Randomise (n=151)

Experimental (n=76)
Lower limb WEBB exercise class (weekly) and home program for 12 months

(n=65)

Control (n=75)
Upper limb and cognition exercise class (weekly) and home program for 12 months

(n=68)

Post-Assessment
Participants

Inclusion criteria
  – attend local stroke club
  – one or more strokes
  – able to walk 10 m independently
  – medical clearance
  – informed consent

Exclusion criteria
  – cognitive impairment (MMSE <20)
  – insufficient communication skills to participate safely
  – medical condition which precludes exercise
WEBB program

- Sit-to-stand
- Semi squats
- Reaching in standing
- Walking in different directions
- Stepping up onto blocks
- Stairs
- Resistance training

Dose

- Exercise class 40 x 45-60 min
- Home program 3 x 45 min/wk
- Advice to walk
Upper limb and cognitive exercise
- strengthening exercises
- dexterity training
- task practice
- management of contracture
- sorting tasks
- matching tasks
- sequencing tasks

Dose
- Exercise class 40 x 45-60 min
- Home program 3 x 45 min/wk
- Advice to use arm
Primary Outcomes

Falls
– proportion of fallers, rate of falls

Walking capacity
– 6-min walk test → distance in m

Walking speed
– 10-m walk test → speed in m/s
Secondary Outcomes

Physical activity
- 7 day pedometer count (steps/day)

Falls risk
- PPA Score

Quality of life
- SF 12v2

Participation
- Adelaide Activities Profile

Impairment measures
- Choice stepping reaction time (s)
- Knee extensor strength (kg)
- Maximal sway (mm)
- Coordinated stability test (errors)
- Single leg stance time (s)

Activity measures
- Timed 5 STS (s)
- TUG (s)
- Step test (#)
Flow through trial

- 309 participants screened
- 151 randomised, 18 withdrew
  - Mean age: 67 years (SD 12, range 31-91)
  - Time since stroke: 6 years (SD 6, range 0-25)
- 11 Stroke Clubs, 1 withdrew
- 8 physiotherapists
- Adherence
  - Exp 51% (SD 26)
  - Con 49% (SD 29)
Results

Falls

Experimental group n=76
47 (62%) people fell

Control group n=75
38 (51%) people fell

RR (of being a faller) 1.22
(95% CI 0.91-1.62, p=0.19)
Results

Rate of Falls

<table>
<thead>
<tr>
<th>Group</th>
<th>Falls (rate per person-year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faster Walkers</td>
<td></td>
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<tr>
<td>IRR 0.96</td>
<td>(95% CI 0.59 to 1.51)</td>
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<tr>
<td>Slower Walkers</td>
<td></td>
</tr>
<tr>
<td>IRR 0.58</td>
<td>(95% CI 0.28 to 1.17)</td>
</tr>
<tr>
<td>All Group</td>
<td></td>
</tr>
<tr>
<td>IRR 1.46</td>
<td>(95% CI 0.77 to 2.80)</td>
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</tbody>
</table>
Results

Walking capacity

MD 34m
(95% CI 19 to 50)

MD 49m
(95% CI 25 to 72)

MD 17m
(95% CI -1 to 36)
**Results**

**Walking speed**

**All**

- **MD 0.07m/s**
  - (95% CI 0.01 to 0.14)

**Faster walkers**

- **MD 0.12m/s**
  - (95% CI 0.03 to 0.21)

**Slower Walkers**

- **MD 0.01m/s**
  - (95% CI -0.07 to 0.1)
# Results

## Secondary outcomes

<table>
<thead>
<tr>
<th>Secondary outcomes</th>
<th>Groups</th>
<th>Month 0</th>
<th>Month 12</th>
<th>Difference within groups</th>
<th>Difference between groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Exp</td>
<td>Con</td>
<td>Exp</td>
<td>Con</td>
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<tr>
<td></td>
<td></td>
<td>(n=76)</td>
<td>(n=75)</td>
<td>(n=76)</td>
<td>(n=75)</td>
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<tr>
<td>Falls Risk</td>
<td></td>
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<tr>
<td>Physiological Profile assessment (Score)</td>
<td>3.1 (1.3)</td>
<td>2.8 (1.2)</td>
<td>3.0 (1.6)</td>
<td>2.9 (1.4)</td>
<td>0.0 (1.1)</td>
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<tr>
<td>Physical Activity</td>
<td></td>
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<tr>
<td>7 day Pedometer count (steps/day)</td>
<td>3,417 (2,702)</td>
<td>3,284 (3,325)</td>
<td>4,365 (3,350)</td>
<td>3,357 (3,256)</td>
<td>738 (2,056)</td>
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<tr>
<td>Quality of Life</td>
<td></td>
<td></td>
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<tr>
<td>SF12v2 Physical Composite (0-100)</td>
<td>37 (10)</td>
<td>33 (9)</td>
<td>37 (9)</td>
<td>35 (10)</td>
<td>0 (9)</td>
</tr>
<tr>
<td>SF12v2 Mental Composite (0-100)</td>
<td>50 (11)</td>
<td>50 (12)</td>
<td>50 (11)</td>
<td>50 (12)</td>
<td>0 (11)</td>
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<tr>
<td>Participation: Adelaide Activities Profile Domains*</td>
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<tr>
<td>AAP Domestic Chores (0-24)</td>
<td>12.0 (6.9)</td>
<td>10.8 (7.3)</td>
<td>12.7 (7.8)</td>
<td>10.4 (7.3)</td>
<td>-0.1 (4.3)</td>
</tr>
<tr>
<td>AAP Household Maintenance (0-21)</td>
<td>7.5 (5.1)</td>
<td>7.7 (5.1)</td>
<td>8.3 (5.1)</td>
<td>7.1 (5.1)</td>
<td>0.4 (3.6)</td>
</tr>
<tr>
<td>AAP Service to Others (0-15)</td>
<td>4.5 (2.9)</td>
<td>4.7 (3.3)</td>
<td>5.5 (3.1)</td>
<td>4.5 (2.5)</td>
<td>0.5 (2.7)</td>
</tr>
<tr>
<td>AAP Social Activities (0-12)</td>
<td>5.1 (1.6)</td>
<td>4.8 (2.0)</td>
<td>5.0 (2.1)</td>
<td>5.5 (2.2)</td>
<td>-0.3 (2.2)</td>
</tr>
</tbody>
</table>
## Results

### Secondary outcomes

<table>
<thead>
<tr>
<th>Impairment and activity</th>
<th>Groups</th>
<th></th>
<th></th>
<th>Difference within groups</th>
<th>Difference between groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcomes</td>
<td>Month 0</td>
<td>Month 12</td>
<td>Month 12 minus Month 0</td>
<td>Month 12 adjusted for Month 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exp (n = 76)</td>
<td>Con (n = 75)</td>
<td>Exp (n = 65)</td>
<td>Con (n = 68)</td>
<td>Exp (n = 65)</td>
</tr>
<tr>
<td>Impairment: Dexterity</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Choice Stepping Reaction Time (s)</td>
<td>63.5 (30.8)</td>
<td>61.0 (29.4)</td>
<td>58.7 (31.4)</td>
<td>67.7 (34.6)</td>
<td>-4.4 (28.9)</td>
</tr>
<tr>
<td>Impairment: Strength</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Affected Knee Strength (kg)*</td>
<td>19.9 (10.2)</td>
<td>18.3 (8.7)</td>
<td>20.5 (8.4)</td>
<td>18.6 (8.4)</td>
<td>0.4 (7.7)</td>
</tr>
<tr>
<td>Intact Knee Strength (kg)*</td>
<td>25.0 (10.7)</td>
<td>23.9 (10.1)</td>
<td>26.6 (8.5)</td>
<td>23.0 (10.6)</td>
<td>1.2 (7.3)</td>
</tr>
<tr>
<td>Impairment :Balance</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Sway Range (mm)</td>
<td>114 (57)</td>
<td>117 (61)</td>
<td>123 (70)</td>
<td>118 (67)</td>
<td>9.3 (60.7)</td>
</tr>
<tr>
<td>Coordinated stability (error)</td>
<td>211 (197)</td>
<td>201 (193)</td>
<td>194 (208)</td>
<td>233 (223)</td>
<td>-12 (12)</td>
</tr>
<tr>
<td>Single Leg Stance-Intact (s)</td>
<td>5.0 (8.0)</td>
<td>5.5 (8.6)</td>
<td>6.2 (8.9)</td>
<td>6.5 (13.5)</td>
<td>1.2 (10.0)</td>
</tr>
<tr>
<td>Single Leg Stance-Affected (s)</td>
<td>1.5 (2.4)</td>
<td>1.8 (4.5)</td>
<td>3.1 (6.6)</td>
<td>2.2 (6.2)</td>
<td>1.5 (5.5)</td>
</tr>
<tr>
<td>Activities</td>
<td></td>
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<tr>
<td>Timed 5 STS (s)</td>
<td>23.7 (14.3)</td>
<td>24.2 (13.9)</td>
<td>20.4 (12.6)</td>
<td>23.4 (15.9)</td>
<td>-1.9 (6.0)</td>
</tr>
<tr>
<td>Timed Up and Go (s)</td>
<td>25.0 (28.3)</td>
<td>30.2 (32.9)</td>
<td>26.3 (34.7)</td>
<td>28.6 (28.3)</td>
<td>4.2 (27.1)</td>
</tr>
<tr>
<td>Step test Intact (#)</td>
<td>5.7 (4.5)</td>
<td>5.9 (4.4)</td>
<td>6.3 (5.1)</td>
<td>6.0 (6.0)</td>
<td>0.6 (2.9)</td>
</tr>
<tr>
<td>Step Test Affected (#)</td>
<td>5.4 (4.0)</td>
<td>5.2 (4.1)</td>
<td>5.8 (4.5)</td>
<td>5.4 (5.3)</td>
<td>0.4 (2.8)</td>
</tr>
</tbody>
</table>

*Note: *p-values are given for the difference between groups when significant.
Conclusion

- WEBB program improves walking capacity and speed
- WEBB program tends to decrease falls in faster walkers and increase them in slower walkers
- Therefore, implement in faster walkers, be cautious in moderate walkers and find alternative mobility and falls prevention programs for slower walkers
Translation into practice
Challenges during trial

- Recruitment
- Adherence
- Sustainability
Translation into practice

Recruitment

• 350 recruitment target, only screened 309
  – In Australia, 350,000 stroke survivors, 88% at home, 80% disability

• Issue of identifying stroke survivors
  – Australian Stroke Clinical Registry (AuSCR)

• Overcoming barriers to exercise
Translation into practice

Adherence

- Dosage
- Modest class adherence and diminishing concordance with home program
  - 50% of intended classes or 60% available classes
  - Records of home program poor
- Strategies to increase adherence
Translation into practice

Sustainability

• 69 participants offered ongoing exercise
  – 26 participants (38%) completed a class
  – 18 participants (26%) participated regularly
    – $6.00 class fee, $1,272 collected = 212 class fees
• 5 clubs expressed interest in ongoing exercise
  – Only 1 club secured an exercise professional
• 61 participants referred to Heartmoves,
  – 9 (14%) had taken up the referral
  – 3 (5%) at a venue outside stroke club
Translation into practice
Overcoming barriers to exercise

- Four main barriers to exercise after stroke have been identified\(^1,2,3\)
  - Physical disability
  - Lack of knowledge about appropriate programs
  - Lack of motivation
  - Lack of transport

\(^1\)Rimmer JH et al J Rehabil Res Dev 2008; 45; 315-22.
\(^2\)Damush Tet al Rehabilitation Nursing 2007; 32(6): 253-262
\(^3\)National Stroke Foundation Stroke Support Strategy (2008)
Translation into practice

• Implementation considerations
  – Slower vs Faster walkers
  – Dose
  – Supervision
  – Nature of the program
Future research

• Falls are a significant issue after stroke
• Other studies
  – LEAPS – Duncan P et al
• Further research needed

• Contact
  – catherine.dean@mq.edu.au
Support

– Funding from NSW Health Promotion Research Demonstration Grant
– Physiotherapists: Cath Kirkham, Fran Moran, Heidi Janssen, Monte Elissa, Doris Lee, Enid Schafer, Meredith Schwilk, Jan Macphail, Sharon Czernieic and Rachelle Love
– Stroke Recovery Association of NSW – Michelle Sharkey, Cheryl Smith, Christina Cotis and Eileen Leather
– Members and volunteers of the following Stroke clubs: Blacktown, Bowral, Cronulla, Hornsby, Liverpool, Merewether, Mortdale, Mosman, Orange, Windsor and Woy Woy
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– Research Assistants and Honours students at University of Sydney
– Members of the Project Advisory Committee